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Last March the French took possession of the Society islands, it is said, at the invitation of the inhabitants, but some of the natives of the island Raiatea attacked a French detachment. England has taken possession of the Fanning islands, south of the Sandwich group. England has also acquired the island of Rarotonga, which is advantageously placed between Panama and Australia, and which France considered as a natural connection between Tahiti and New Caledonia.

Germany has declared the neighboring Tonga group, which England intended to take possession of, to be neutral in accordance with the agreement signed by both powers April 6, 1886.

GEOLOGY AND PALÆONTOLOGY.

CREDNER ON PALÆOHATTERIA. The seventh part of Dr. H. Credner's account of the Stegocephali and Saurians found in the "Plauens'ch Grounds," near Dresden, is devoted to the above-named interesting genus of Reptilia. A single species is embraced in the genus, *P. longicaudata* Credner. This animal was of about the size of the *Sphenodon punctatum* of New Zealand, and presents so many points of affinity, that Dr. Credner places it in the same order, the Rhynchocephalia, and even in the same family, the Sphenodontidæ.

An examination of Professor Credner's description and the figures with which it is abundantly illustrated, shows that its describer has not overrated the importance to biology of its discovery. But its nearest ally is not, as Professor Credner supposes, the *Sphenodon punctatum* of New Zealand, but the fossil *Stereosternum tumidum* from the probable carboniferous formation of Brazil. It differs widely from Sphenodon in the character of the pelvis, agreeing in this with Stereosternum, and with the Pelycosauria. 'It differs from the Pelycosauria in its two postorbital cranial arches, and in its single-headed ribs, agreeing in the latter point with both Stereosternum and Sphenodon; and probably in the former point also, but the character of the cranial arches in Stereosternum remains unknown. It agrees also with the Brazilian genus in the characters of the tarsus, and differs more from the Pelycosauria and less from the Sphenodon. The humerus is also like that of Stereosternum.

The conclusion is that Palæohatteria is one of the Proganosauria, and that it is probably a member of the family of the Stereosternidæ. The division Proganosauria differs from the Rhynchocephalia by the structure of the pelvis.

Since the above was written, a review of Professor Credner's paper, by Dr. G. Baur, appeared in the February number of the *Americau Journal of Science and Arts.* His conclusions are similar to those reached by myself.—E. D. COPE.

BROGNIART AND DÖDERLEIN ON XENACANTHINA. Thanks to these authors we are now well acquainted with the structure of this important type of palæozoic fish. M. Brogniart[1] has described the structure of the skeleton, and Professor Döderlein[2] gives us that of the skull. The former bases his observations on numerous specimens from Commentry, and the latter on material from the coal formation of Alsace. He shows that it is nearly allied to Didymodus from the North American Permian, and represents the same ancestral type of fishes. The cranial structure is that of an Opistharthrous shark; that of the lateral fins is of a Dipnoan type; while the characters of the median fins are those of a primitive Teleostome, as seen in some Crossopterygia. There is a well developed hyomandibular; and the toothed spine, long known as a separate body, and first identified by Kner, is articulated with the posterior median part of the cranium. The pectoral fin is unsymmetrically bipinnate, and the ventrals are unipinnate. They arise from a lateral cartilage, and terminate in a simple, elongate, fringed plate, which is the position of the male organ of the sharks. The vertebral centra are unossified, but intercentra and mesial spines are present, the former supporting short ribs. The dorsal fin is especially interesting, as displaying one of the primitive stages of development of this organ. It is distinguished by the enormous size of its basiosts, which, as in Lepidosiren, are articulated with the axinosts. The fin radii also articulate with the baseosts, thus differing from the Lepidosirenidæ, and agreeing with Pheneropleuron. And all these support with the neural spines, confirming the view which I have taken of the original relation of the fins to the vertebral column.

Dr. Döderlein agrees very nearly with the position assigned this division (the Ichthyotomi) by the present writer, except that he thinks that it should be separated from the Elasmo-

[1] Etudes sur le Terrain Houillier de Commentry, par C. Brogniart et E. Sauvage.

[2] Zoologischer Anzeiger, 1889, March 4th.

branchii and maintained as a distinct class like the Dipnoi. He employs Lütken's name, Xenacthini for it, but this must be clearly retained for the subdivision of the Ichthyotomi to which Xenacanthus properly belongs. If for instance, it should be discovered that Acanthodes belongs to the Ichthyotomi, (AMERICAN NATURALIST, 1887, p. 1016) the Xenacanthini and Acanthodini would be two of its primary divisions.

It is to be regretted that M. Brongniart was not better acquainted with the work done in America on this group, as he would have been thus spared the necessity of making some new names.—E. D. COPE.

CROLL ON MISCONCEPTIONS REGARDING THE EVIDENCE OF FORMER GLACIAL PERIODS. In a paper read before the Geological Society of London, January 23, 1889, Dr. James Croll made the following statement:—

The imperfection of the geological record is greater than is usually believed. Not only are the records of ancient glacial conditions imperfect, but this follows from the principles of geology. The evidence of glaciation is to be found chiefly on *land-surfaces*, and the ancient land-surfaces have not, as a rule, been preserved. Practically, the several formations consist of old sea-bottoms, formed out of material derived from the degradation of old land-surfaces. The exceptions are trifling, such as the underlayer of coal-seams and dirt-beds, like those of Portland. The transformation of an old land-surface into a sea-bottom will probably obliterate every trace of glaciation; even the stones would be deprived of their ice-markings; the preservation of boulder-clay, as such, would be exceptional. The absence of large, erratic blocks, in the stratified beds, may indicate a period of extreme glaciation, or one absolutely free from ice. The more complete the glaciation the less probability of the ice-sheet containing any blocks, since the rocks would be covered up. Because there are no large boulders in the strata of Greenland or Spitzbergen, Nordenskiold maintains that there were no glacial conditions there down to the termination of the Miocene period. The author maintained that glaciation is the normal condition of polar regions, and if these at any time were free from ice, it could only arise from exceptional circumstances, such as a peculiar distribution of land and water. It was extremely improbable that such a state of things could have prevailed during the whole of the long period from the Silurian to the close of the Tertiary.

A million years hence, it would be difficult to find any trace

of what we now call the glacial epoch; though if the stratified rocks of the earth's crust consisted of old land-surfaces, instead of old sea-bottoms, traces of many glacial periods might be detected. The present land-surface will be entirely destroyed, in order to form the future sea-bottom. It is only those objects which lie in existing sea-bottoms which will remain as monuments of the post-tertiary glacial epoch. It is then probable that the geologist of the future will find in the rocks formed out of the non-existing sea-bottom more evidence of a glacial epoch during post-tertiary times than we now do of one, say, during the Miocene, Eocene, or Permian period. Palæntology can afford but little reliable information as to the existence of former glacial periods.

THE VERTEBRATA OF THE SWIFT CURRENT RIVER, II. In the NATURALIST for 1885, p. 163, the writer gave a brief account of the vertebrata of the above locality obtained by the Geological Survey of the Dominion of Canada. Explorations set on foot by the Director of the Survey, Dr. A. R. C. Selwyn, during the year 1888, resulted in the obtaining of a number of additional species, some of which are of considerable interest. In describing these, I will enumerate those already known from that locality. The specimens are generally in a fragmentary condition, owing to the conglomeritic nature of the deposit. The new material was obtained by Mr. T. C. Weston, of the Survey. The total number of species is seventeen.

PISCES.

Amia sp., numerous vertebræ.

REPTILIA.

Trionyx sp., Ann. Report, G. N. H. Survey, Canada, 1885, c. p., 79.

Stylemys sp. loc. cit.

MAMMALIA.

Rodentia.

Palæolagus turgidus Cope, loc. cit.

Bunotheria.

Hemiopsaldon grandis Cope, loc. cit., and American Naturalist, 1885, p. 163.

Ancylopoda.

Chalicotherium bilobatum sp. nov.

Founded on a mandibular symphysis and part of the left ramus of an adult animal, which contains the alveoli of the anterior four molars, and part of that of the fifth. All the premolars are two-rooted, showing that they are but three in number. Canines and incisors wanting, the anterior alveolar margin thin and little prominent, and bilobed, with a median emargination. Symphysis coössified, with an angulate inferior margin, posteriorly with a fossa on each side of the median line, sloping regularly upwards to the alveolar margin, and concave above behind the margin. Minute traces of alveoli of a canine and two incisors on each side, which were probably present in the fœtus. Length of symphysis above, 120 mm.; depth posteriorly, 48 mm. Length of symphysis in front of p. m. iii. Length of premolar series, 75 mm. Length of m. i., 40 mm.

Although this is the first announcement of the discovery of the genus Chalicotherium in America, it is not the first discovery. Professor Scott showed me a series of superior molars from the Loup Fork formation of Kansas, from the Agassiz Museum, which he identified as belonging to this genus. The present species is of larger size than the Kansas form, and is apparently equal to the *C. goldfussii* of the Upper Miocene of Europe. The occurrence of this form in the Lower Miocene (White River), as well as the Upper Miocene (Loup Fork), of this country, is a noteworthy fact, but is parallel to its history in Europe. Described from the upper Miocene by Kaup, it was afterwards found in the middle Miocene (*C. grande*) by Lartet, and in the Upper Eocene (*C. modicum*), by Gaudry.

The remarkable character of this genus, as discovered by Filhol, has been already mentioned in the NATURALIST.[1] It has little relation to the family of Perissodactyla, to which it has given the name, and which it so resembles in molar dentition. It must form a family by itself, and the genera with which it has been associated must form a family to which the name Lambdotheriidæ may be applied. The anterior ungual phalanges of Chalicotherium are of prehensile character and not ungulate, but rather unguiculate. The phalanges resemble those of the Edentata, but the carpus and tarsus are, according to Filhol, diplarthrous in structure, while the Edentata are taxeopodous. We have in the Chalicotheriidæ the antithesis of the Condylarthra. While the latter is ungulate with an unguiculate carpus and tarsus, the former is unguiculate with an ungulate (diplarthrous) carpus and tarsus. Thus

[1] Osborn on Chalicotherium, 1888, p. 728.

the Chalicotheriidæ must be referred to a distinct order of unguiculate Mammalia, which I propose to call the Ancylopoda, with the above definition. Two genera belong to the single family, the Chalicotheriidæ; viz., Chalicotherium Kaup, and Ancylotherium Gaudry. In the former, the phalanges are distinct; in the latter the first and second are coössified (Lydekker). Marsh has not yet shown how his genus Moropus differs from Ancylotherium. The species described by Marsh under this name are from the Loup Fork bed of Kansas.

Perissodactyla.

Haplacodon augustigenis, Cope, gen. nov. *Menodus angustigenis*, Cope, Annual Report, G. N. H. Survey, Canada, 1885. C, p. 81.

Char. gen. Additional specimens of the species described, as above cited, show that it cannot be referred to the genus Menodus, but that it belongs to the family Lambdotheriidæ (Chalicotheriidæ *olim*) as at present defined. It differs from all the genera of the Menodontidæ in the presence of but a single internal cusp of the first (posterior) superior premolar, a fact which renders it highly probable that the premolars which precede it in the maxillary bone, were similarly constituted. It differs from all other genera of Lambdotheriidæ and also from Diplacodon, to which it is allied, in the presence of but two inferior incisors on each side. It is not certain whether it possesses horns or not.

Menodus sp. Cope, Ann. Report, l. c. p. 83.

This species is allied to the *M. giganteus* Leidy, but whether identical or not can not be yet ascertained.

Anchitherium westoni sp. nov.

This species is represented by a single superior molar, and two inferior molars, the latter in place in a part of the mandible. The teeth are smaller than those of the *A. bairdii*, from which they also differ in their greater transverse as compared with their anteroposterior diameters. The intermediate tubercle of the posterior crosscrest is more distinct than that of the anterior, and the posterior intermediate cingular cusp, so prominent in the *A. bairdii*, is here wanting. The posterior cingulum continues round the internal base of the posterior internal cusp. Diameters of superior molar; transverse, 13.5 mm.; anteroposterior, 10 mm. Diameters of inferior molar; transverse, 8 mm.; anteroposterior, 10.5 mm. This species, interesting for its primitive character in the absence of the

posterior cingular cusp, is dedicated to Mr. T. C. Weston, the explorer of the region from which these fossils were obtained.

Aceratherium mite Cope, l. c.

Aceratherium pumilum Cope, l. c.

Artiodactyla.

Hypertragulus transversus sp. nov.

Indicated by two superior molar teeth of old individuals. They are of nearly twice the linear dimensions of the only known species, *H. calcaratus* Cope. The external cusps are subconical, and the external rib which separates them in Leptomeryx is wanting here. Anterior cingular cusp small. The anterior bone of the posterior internal crescent enters the notch between the external cusps but does not fuse with either of them. Slight cingula on the anterior and posterior sides of the internal lobes which do not pass round their internal sides. No external cingulum. Diameters, anteroposterior, 12 mm.; transverse (at base) 15 mm. Crown very brachyodont.

Leptomeryx esulcatus sp. nov.

A single superior molar indicates this species, which is of about the dimensions of the *L. evansii.* It differs distinctly from this Tragulid, in the greater convexity of the external face of the external cusps, and the absence of the sulci which define an external median rib of that surface in the *L. evansii.* The rib which bounds the external faces of the cusps from each other is present. Anterior external cingular cusp small, continuous with anterior cingulum. No internal nor external cingulum. Diameters of crown; anteroposterior, 6.5 mm., transverse, 7.5 mm.

Leptomeryx mammifer Cope, Report, G. N. H. Survey, Canada, 1885, C p. 84.

Four superior molars add to the characters already derived from mandibular teeth as above cited. The median and anterior external cingular cusps are large and obtusely subconical. The anterior external cusp has a very strong median external rib, while the posterior has a very weak one. The anterior horns of the internal crescents are much produced; the posterior but little. The cingula are slight, and are not continued round the internal base. Diameters of superior molar; anteroposterior, 11 mm.; transverse, 11.5 mm.

Leptomeryx semicinctus sp. nov.

A large species possessing twice the linear dimensions of the *L. evansii* in the superior molar teeth, is represented by three

of the teeth designated. In these the external crescents are more compressed and less conical than the two species above described, resembling more nearly those of the *L. evansii.* The posterior has a weak vertical rib; the anterior a strong one. The external cingular cusps are thoroughly fused with the external crescents, forming their anterior horns. The anterior horns of the internal crescents are a little more produced than the posterior. No external or posterior cingulum; a much interrupted anterior cingulum, which is continued round the internal base of the anterior crescent, which is further continued on the anterior side of the internal base of the posterior crescent. Enamel finely wrinkled. Diameters; anteroposterior 14 mm.; transverse, at base, 15 mm.

Oreodontidæ, an inferior first premolar.

Elotherium mortoni Leidy; l. c.

Remarks.

The continued scarcity of Oreodontidæ is matter of surprise. Their place is supplied so far, by an increased number of Tragulidæ (four species). The presence of a genus of Lambdotheriidæ, Haplacodon, increases the impression of antiquity of the fauna produced by the presence of a Creodont (Hemipsalodon.)

MINERALOGY AND PETROGRAPHY.[1]

PETROGRAPHICAL NEWS.—Interbedded with the Tertiary schists of the western Cordilleras in Peru and Bolivia, are andesites, which are divided by Rudolph[2] into a western area of pyroxene-andesites, an eastern area of horn blende-andesites and a middle area of a variety intermediate between these two. The structure of each class varies from those types in which there is a devitrified glassy groundmass, to those in which the groundmass is microcrystalline. The plagioclase is andesin that has suffered alteration in the center because of the more basic character of this portion. The pyroxene-andesites contain augite twinned parallel to $P\bar{\infty}$, and also an orthorombic pyroxene with a cleavage parallel to $\infty P\bar{\infty}$ and a parting parallel to $0P$. Both augites have in some cases undergone alteration into bastite. By an increase in the amount of hornblende the

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.

[2] Miner. u. Petrog. Mitth. ix. p. 269.